

# The effects of demographic structures on savings in Eastern European countries

Tuğba AKIN\*, Kiyemet YAVUZASLAN \*\*

## Abstract

*The impacts of demographic factors on savings need to be investigated in order to accurately analyse the saving differences between the countries. The propensity of countries for saving is determined by their demographic structures besides the decision-makers' preferences related to the economy. Eastern European Countries generally have a common historical background; they have been exposed to many changes both politically and economically over time. In this study, the Eastern European Countries' national savings were analysed for the 1996-2017 period by using panel data analysis methods. According to the findings, in Eastern European countries there was a positive relationship between female labour force participation rate, urbanization rate, population growth rate, and savings, while the old and young dependency rates have a negative impact on savings. A negative and statistically insignificant relationship was found between life expectancy rate and savings. This paper is the first research which could provide an explanation for these countries' savings behaviour in relation to demographic factors and may thus provide policymakers with some ideas.*

**Keywords:** Eastern European countries, saving, demographic structure, panel data

## Introduction

Saving, the residual portion of income remained after all spendings, is a resource of income at the same time. Since personal saving behaviour is determinant for the saving tendency and consequently, for the total income of a country, it is substantial for a country's economic model. Due to a significant role of savings in economic growth, especially developing countries are reluctant to the saving gap problem. Various policies are adopted to avoid such unpleasant circumstances. In

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this line, there have been a lot of papers in the literature in terms of countries' saving and relevant aspects by using different econometric methods.

In conjunction with globalization, new integrations have taken place across the world economic system along the recent period. Yet, not only economically, these integrations have included diverse practices that could result in supra-national formations, such as free-circulation rights. In this regard, the most comprehensive policies have been adopted by the European Union (EU). Since "the common market" policy is in effect for the free circulation of goods, services, capital and citizens of the Schengen territory, the borders among the EU Countries have been abolished. As aforesaid, policies were put in effect since the Rome Treaty in 1957, when the transfer of goods and services from one member country to another was enabled, which resulted in the free migration of labour and an enormous immigration wave across the EU countries (Valiyeva, 2016). The eastward expansion of the EU, accompanied by the free trade among countries has steered young population (more than 2.5% of population) from Eastern European Countries to other EU members which offered greater employment opportunities.

With regard to Eastern European countries, various classifications could be encountered in the existing literature. Based on the United Nations (UN) country classification (UN, 2018); Belarus, Bulgaria, Czech Republic, Poland, Hungary, Moldova, Romania, Russia, Ukraine, and Slovakia are classified as Eastern European Countries. The majority of these countries were under the dominance of the former Union of Soviet Socialist Republics (USSR) for a long period of time. With the dispersion of the USSR, a social transformation process was experienced after the 1990s; and the Eastern European countries gained new members referred to as transition economies because of their economic structure in a transition from a public-dominated economic system to a market economy founded on principles of private property (including private saving). In the majority of the countries experiencing the post-communist era, it was seen that the income difference between western and eastern European countries has decreased and social life has developed remarkably. These countries, with different historical backgrounds and wealth distribution, have pursued different growth policies.

The literature emphasizes that the citizens of the Eastern European Countries were entitled to greater property rights, freedom as well as higher living standards (Šlosarcík, 2011; Shleifer and Treisman, 2014; Alexandrova-Arbatova, 2016; UNECE 2016; Djankov, 2016). The impact of common demographic structures within the territory that they share, new supra-national formations in which they take part, e.g. the EU and the experienced political evolution on Eastern European Countries' saving amount and determinants of savings are worth investigating into. The impact of distinctive structures of concerned countries on savings is assumed to be differentiated from both their country classification group and the rest of the world. It is also possible to run across new debates on some of the determinants of savings in Eastern European Countries witnessing social and economic

transformation process as well as the debates on a theoretical point of view towards the saving concept.

The present study aims to investigate the effects of demographic characteristics on the saving behaviors across the Eastern European countries over the period 1996-2017 by using panel co-integration analysis. We follow the UN classification and consider the following countries to be part of Eastern Europe (due to their similar structures in terms of historical and geopolitical aspects): Belarus, Bulgaria, Czech Republic, Poland, Hungary, Moldova, Romania, Russia, Ukraine and Slovakia. The paper wishes to draw attention to the importance of demographic factors in the policies implemented by policy makers to increase savings. Having established this aim, the study comprises five sections; following the introduction, the first chapter includes current literature on demographical determinants of savings, which were identified by surveying the existing literature. We briefly explain the economic transformations occurred within Eastern European Countries during the post-communist era by providing a series of primary economic indicators in the second chapter. In the third chapter, the empirical analyses are presented. In the last section is conclusion.

## 1. Literature

When considering the determinants of savings, a certain number of researchers have developed both empirical as well as theoretical models which show the effects of these kinds of determinants on international savings. These studies employ various methods on different countries or country sets and report some findings on the determinants of saving. Recently, the importance of the explanatory strength of social developments on primary economic indicators has come to prominence (Royuela *et al.*, 2018; Roman *et al.*, 2018). In the aftermath of the global economic crisis, various views implying that demographical indicators such as social status, age and etc., household behaviours have a greater impact on macroeconomic indicators, saving and consumption than assumed by theoretical expectations.

In the frontier empirical study revealing the impact of age dependency rates and of unemployed population on country savings, Leff (1969) concludes that demographic variables have a greater impact on savings especially in developing countries. Similarly, Modigliani (1970), Modigliani and Sterling (1983), Graham (1987), Masson and Tryon (1990) and Masson *et al.* (1998) report findings supporting that high young and old-age dependency rate are correlated with low saving rates.

By investigating the factors effective on saving in Colombia for the period of 1925-1995 by VAR Analysis, Cárdenas and Escobar (1998) report that saving rate tends to decrease especially when urbanization and age dependency rates increase. For instance, if the diversity of the countryside production is more extensive with respect to urban, saving would adversely be affected by the increasing urbanization rate.

In their study conducted on underdeveloped OECD countries, by employing Pooled Panel LS and Panel GMM methods, Loayza *et al.* (2000) handle determinants of private sector savings and take the young dependency rate, old dependency rate and urbanization rate as demographic determinants. As a conclusion, authors report that an increase in young and old dependency rates and urbanization rate have a negative impact on private sector savings. This situation could point to the fact that any rise in the young and old dependency rates increases the consumption burden of individuals.

Hussain and Brookins (2001) report the determinant factors of national saving by utilizing data from the Extreme Bound Analysis as well as these factors' relationships and their directions by using Panel Data Analysis. In their study conducted on different country groups, the authors emphasize that urban population, female labour force participation rate, old and young age dependency rates are not robust determinants of savings and that any increase in these factors causes a decrease in saving.

In their study including 15 OECD countries Serres and Pelgrin (2002) examined the effect of non-wealth determinants such as old dependency and labor force productivity on private saving rates based on data from the period 1970-2000 by applying estimation techniques for systems of dynamic panel equations. Their findings suggest that there is a sharp decrease in private savings of developing OECD countries after the 1990s and that the saving rates of the private sector are significantly affected by the public sector.

Chamon and Parasad (2010) focused on microdata contained by urban household surveys conducted along 1990-2005 to analyze saving behaviors of urban households in China through Panel Data Analysis method. As the authors are concerned with saving behaviors of Chinese residential property owners, they conclude that the savings of individuals decrease remarkably after the age of 45 and above; and that the young population tends to make more savings compared to the elderly because the older working-age groups are the most affected by market-oriented reforms. Chamon and Parasad (2010) assess their findings as that health and education expenses play a primary role in the determination of saving behaviours. In addition, they mentioned that health expenses are more determinant in comparison with education expenses on saving behaviours of elderly households in China.

By employing the Panel Data Analysis method in their study so as to determine whether demographic changes are effective on the saving increase for 85 countries for the period 1960 - 2005, Bosworth and Reich (2006) reveal that aging has an adverse impact on saving rates. The authors report that demographic variables are particularly more effective on saving rates for Asian economies but that no finding was relevant regarding the demographic impact in the industrial countries. In his study conducted on East Asian Countries, Hu (2015) reports evidence supporting that the increasing young population causes an increase in national saving even though this may not increase household saving.

Attanasio *et al.* (2008) analyse the correlation between female labour force participation rate specifically estimated for American females born in 1930, 1940 and 1950s and their saving and consumption behaviours by using baseline parameter and simulation and imply that especially in line with the childcare sector's development, costs have developed and this resulted in an increasing female labor force participation rate and that, ultimately, these low costs have a positive impact on savings.

Özcan *et al.* (2003) reconsider the theoretical approach toward saving with their study on the political atmosphere dominated by uncertainty in Turkey in the 1968-1994. In their study handling the subject within the life-cycle hypothesis, political instability, old dependency and population are selected as non-economic variables. Old dependency and political instability are reported as variables negatively effective on savings while other variables are indicated with their positive effect on saving.

Niculescu-Aron and Mihăescu (2012), by clustering 15 EU countries as Western, Central and Eastern European Country groups, strive to find fundamental determinants of saving by analysing data from 1995-2010 by employing panel data analysis method. For the period analysed, the study reveals that, especially for Central and Eastern Europe, the most important factor effective on saving is safe and sustainable income while no other finding is reported for the Western European cluster.

In the study conducted on Japan, China and India by Curtis *et al.* (2017), the extent to which savings are influenced by demographic variations is analysed and it is reported that decreasing young age dependency rate increases saving especially in China and India. Additionally, it is reported that the decreasing saving rate in Japan since mid-1970s has been caused by a gradual increase in retired and old population. Although countries show demographic differences, the authors' study significantly supports the life-cycle hypothesis. Similarly, Ge *et al.* (2012) conclude in their study that decreases in young dependency rate results in increasing saving even among young parents or no-children families.

In the present study, by employing Pedroni and Kao Panel Co-integration Test methods, which have not been used so far by the current relevant literature, demographic factors effective on saving behaviours have been investigated for the relevant country group. In this regard, we expect to make a contribution to the relevant literature with the findings of this paper.

Demographic factors have been suggested by some writers as important determinants of savings rates especially, the communist countries of Eastern Europe which are "exceptions" to a per capita income-savings rate model, fit nicely into an approach which includes demographic conditions (Leff, 1969, p. 887). On the other hand, there is not a significant research for Eastern European countries. So, this paper should be worthwhile to see if inclusion of demographic factors does increase our capacity to explain these countries' savings behaviour.

## **2. Economic status of Eastern European countries and development of domestic saving**

The USSR collapsed in 1991 and left its place to 15 new countries (Blanchard, 1997). Countries emerged as a result of the dissolution of the USSR had socio-economically and culturally distinct characteristics because of the policies pursued before the independence period. These countries include Eastern Europe (Russia, Belarus, Ukraine, Moldova), Baltic (Estonia, Latvia, Lithuania), Caucasia (Georgia, Armenia, Azerbaijan) and Central Asia (Turkmenistan, Uzbekistan, Kirgizstan, Kazakhstan, Tajikistan) (Gürbüz and Karabulut, 2009). The revolution sparked across Eastern Europe in 1989, which also caused the dissolution of the USSR, was managed under the influence of a desire to gain a high level of political independence and economic efficiency. Consequently, this has resulted in the collapse of the COMECON (Council for Mutual Economic Assistance), which is basis of the socialist foreign trade system and regional economic integration (Uludağ and Mehmedov, 1992, p. 369).

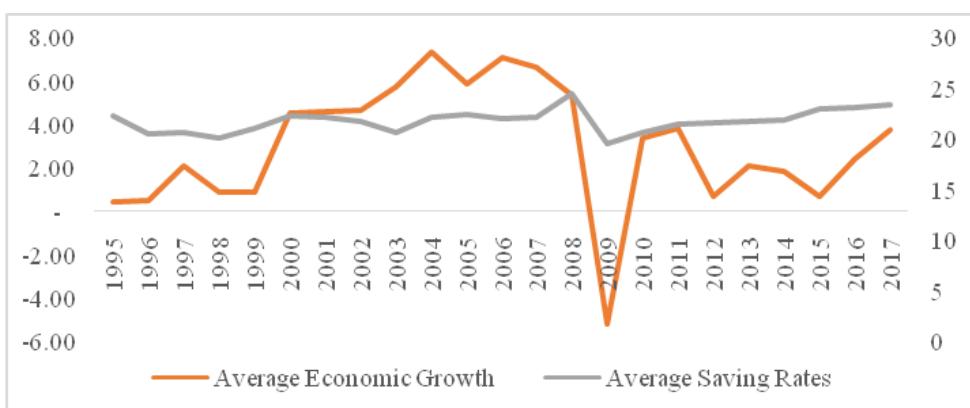
It is possible to claim that there has been a remarkable transformation experienced in Eastern European Countries along the last quarter century since the fall of the Soviet Union and communism. In this progress, it has been observed that household income of the residents of Eastern European Countries has almost reached the average European income and their average life expectancy period has extended (Jarmołowicz and Piątek, 2013). Nevertheless, another development was the economic growth varying from one country to another across Eastern Europe after joining the EU (Djankov, 2016).

For gaining the fast transformation along the post-communism period, Eastern European Countries which broke up with the USSR in the 90s needed to acquire economic freedom and to re-establish their economic growth. In the initial period of the transition, new government bodies were founded so as to ensure productive and transparent development of markets which constitute the basis of economic models of countries. On the other hand, the privatization of public businesses was considered the necessary priority for maintaining macroeconomic stability (Shleifer and Vishny 1993; Djankov *et al.*, 2003; Djankov, 2016). While the economic status in the beginning of the 1990s was rather difficult, it can be seen that former USSR countries launched comprehensive economic and political reform programs after they won their independence in 1991. These countries made a fast transition from a strict, economically controlled system to market economy so that they could develop economic growth and living standards. Eastern European Countries first prioritized the maintenance of stability of prices, foreign trade, the transformation and exchange system as well as the privatization of small and medium-sized businesses (Oleksiuk, 2017).

Although individual national incomes of Eastern European Countries decreased in the early years of transition (1990-1995) and during the 2008 Global

Crisis (2008-2010), Djankov (2016) shows that the average growth rate of Eastern Europe was higher than the world average in the last 25 years. Besides, the economic and political collapse of the USSR triggered a high inflation rate which remarkably eroded living standards in concerned countries (Oleksiuk, 2017). Especially Russia experienced more serious issues in the first seven-year-period following the dissolution of the USSR in comparison with other Eastern European Countries (1991-1998). Zatonski *et al.* (2008) emphasize that the 30% shrink of the Russian GDP and its exposure to the 2000% inflation rate in 1992 were a proof of this diagnosis. It could also be seen that Romania displayed the largest growth performance among the Eastern European Countries in 2016 while it had the lowest economic growth rate in 1991.

**Figure 1. Average economic growth and saving rates in Eastern European countries (%)**

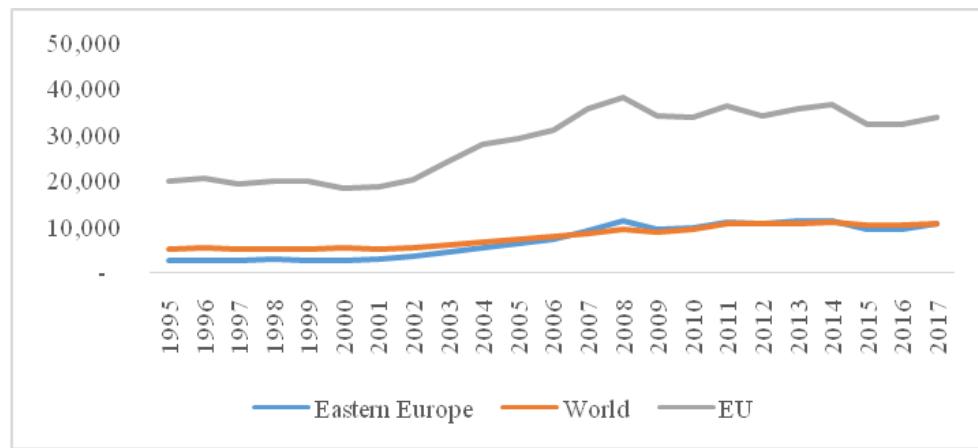


Source: World Bank, 2018.

Figure 1 demonstrates that the average growth and saving rates of Eastern European Countries for the period 1995-2017, since this is the longest possible time span for analysis because data from investigated countries were accessible after the collapse of the USSR. In general, increasing the utilization of the current capital inherited from the socialist era has been the most substantial economic growth factor for Eastern European Countries in the 1990s (Oleksiuk, 2017). In the post-2008 crisis period across the Euro region, an economic slowdown and decreasing productivity were observed in Eastern Europe as well as an economic recession, which was tougher than the EU average in 2009. According to Figure 1 exhibiting economic growth and saving rates of Eastern European Countries, we may see that saving rates have increased the aftermath of the crisis although both economic growth and saving rates decreased in 2009. It may be seen that the average economic growth rate of

Eastern European Countries has not reached this level in the period between 2000 and 2008.

**Figure 2. GDP per capita in the EU, Eastern Europe and in the world (average USD)**



Source: World Bank, 2018.

Figure 2 shows a comparison of the average per capita income of the EU, the World and Eastern European Countries for the period 1995-2017. The per capita income of Eastern European Countries has increased from 2,743 US Dollars to 10,625 US Dollars along 1995-2017. According to Figure 2, Eastern European Countries' average income outperformed the average world one after 2006 until 2014. On the other hand, details of the per capita income with a trend below the world average since 2014 could be assessed by comparing Eastern European Countries. While Czech Republic was the country with the highest per capita income, with 20,368 US Dollars in 2017, the lowest per capita income Eastern European Country was Moldova with 2,290 US Dollars.

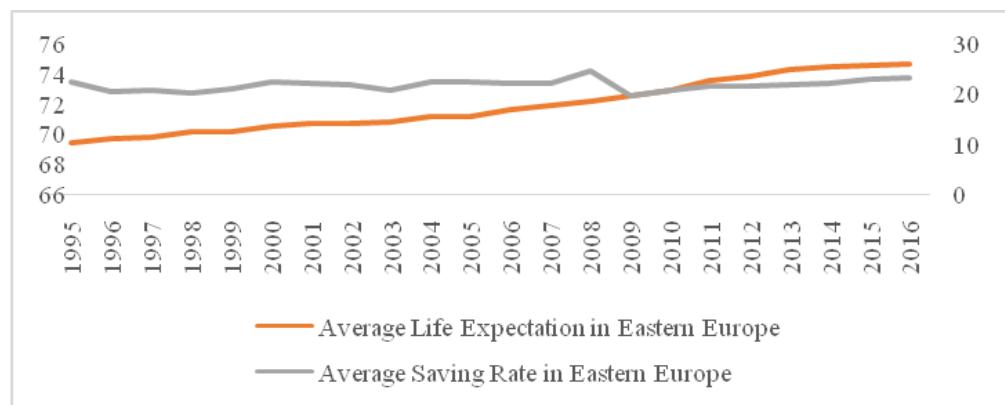
In spite of the smooth GDP performance development since the 90s, the living standards in Eastern Europe have remarkably advanced for most of the population. This standard development could be observed from consumer behaviours in Eastern European Countries. A notable development has been seen with the automobile purchases, foreign country visits and elite college education spending of citizens of Eastern European Countries in the post-communism period. For instance, it was documented that 3 out of 10 citizens of Eastern European Countries owned a luxury car in the period between 1993 (the first year of formally issued statistics) and 2015. Accordingly, it could be inferred that a higher rate of citizens from Eastern Europe owned luxury cars compared to citizens of Belgium. Another example is that the automobile ownership rate in Poland is greater than in Great Britain or France

(UNECE, 2016). While Eastern European citizens were rarely being allowed go abroad for traveling during the communism era, 110 million residents went abroad overall in 2015 (Djankov, 2016).

In addition to these advancements in living standards of Eastern European Countries, various adverse demographic trends were observed in the beginning of the transition period due to the economic uncertainties. In this regard, it is necessary to investigate life expectancy in Eastern European Countries.

Along the last quarter century, life expectancy has continually increased in Eastern Europe. As of 2016, whereas the average world life expectancy was 72.03, in Eastern European Countries (World Bank, 2018), it was 74.60. Although life expectancy across Eastern European Countries was higher than the world average, it remained at low level after 1991. Djankov (2016) points to the stress caused by the economic transition as the reason for this situation. Especially, average life expectancy increased in numbers of East European countries following their membership to the EU in 2004. The birth rate of 2.1 reported for Eastern Europe in 1988 decreased to 1.2 in 1998, at the end of the transition period of communism. However, the essential acquisition was the baby death rate decreased by 50% around the region (European Commission, 2015). When life expectancy levels of countries were considered individually, the highest life expectancy level was observed in the Czech Republic in 2016; and the lowest was in Ukraine.

**Figure 3. Life expectation and saving rates in Eastern Europe (Average %)**



Source: World Bank, 2018.

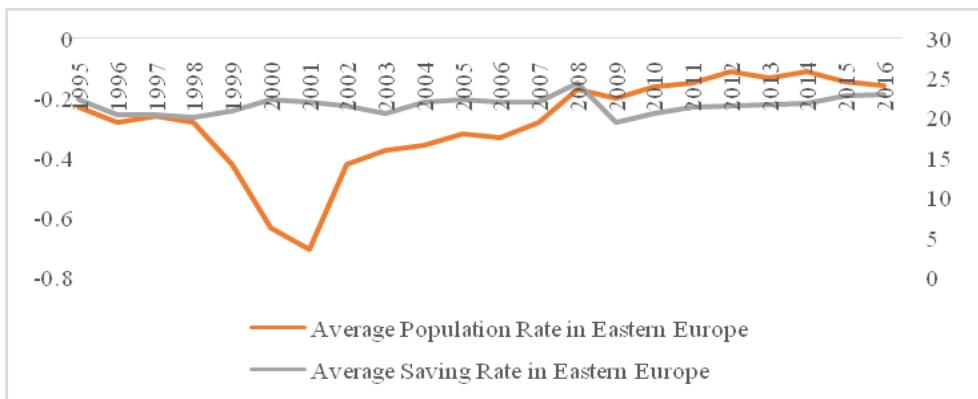
Figure 3 compares the average life expectancy and saving rates of Eastern European Countries. According to Figure 3, it is possible to observe that the increasing trend of life expectancy reflects the pace of saving rate before 2009.

Another incident which deteriorated demographical trend one step further in Eastern European Countries was caused by the migration of the labour force.

Following the eastward EU expansion in 2004 and 2007, the mobility of labor force has significantly intensified (Fóti, 2011, p. 95). For 2004, while about 2 million workers from Eastern Europe were living in the EU, this figure reached 4.8 million in 2009 (Eurostat, 2016).

Abolished bans on labor mobility against Bulgarian and Romanian citizens across nine EU members including Germany, France and the UK in 2014 sparked a new immigration wave (Fóti, 2011). The migration from Eastern Europe to the EU has especially elevated during the recovery period in 10 EU members after the 2008 crisis. It was seen that 6.3 million Eastern Europeans started to live in the EU Countries as of March 2016 (Eurostat, 2016).

**Figure 4. Population growth and saving rates in Eastern Europe (Average %)**



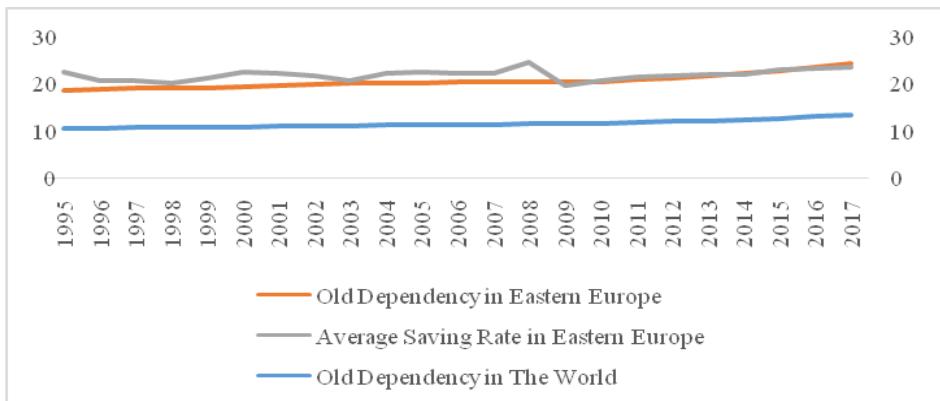
Source: World Bank, 2018.

As displayed in Figure 4, there is a strong correlation between labor mobility and economic conditions, i.e. the population rate increased during the Euro crisis in 2009. Bulgaria, Moldova, Romania, Ukraine and Hungary experienced a population decrease in this period. Czech Republic displayed the highest population growth rate in 2016. Furthermore, when compared to saving rates, saving rates have not increased in Eastern European Countries in spite of the population growth after 2009.

When Old Dependency Rate (ODR), the number of citizens older than 65 per 100 employable citizens aged 15-64, was taken into consideration, the average rate of Eastern European Countries showed a higher rate than the world averages. The average world ODR was 11.36% for the period 1991-2016. Moldova's average ODR was 12.32%, the closest to the world average as an Eastern European country. The highest ODR was shown by Hungary with %20.31. According to Figure 5, which compares ODR and saving rates, no significant variation was seen with average ODR of Eastern Europe over years while saving rates showed a volatile pattern. This status

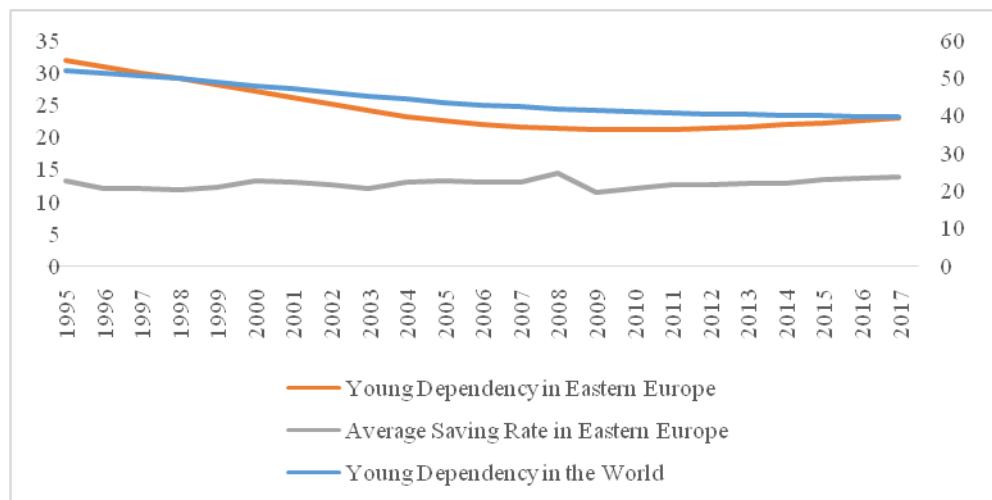
could be perceived as normal since it was caused by the prevailing demographic characteristics of the concerned countries.

**Figure 5. Old dependency and saving rates in Eastern Europe (Average %)**



Source: World Bank and Eurostat.

**Figure 6. Young age dependency and saving rates in Eastern Europe (average %)**

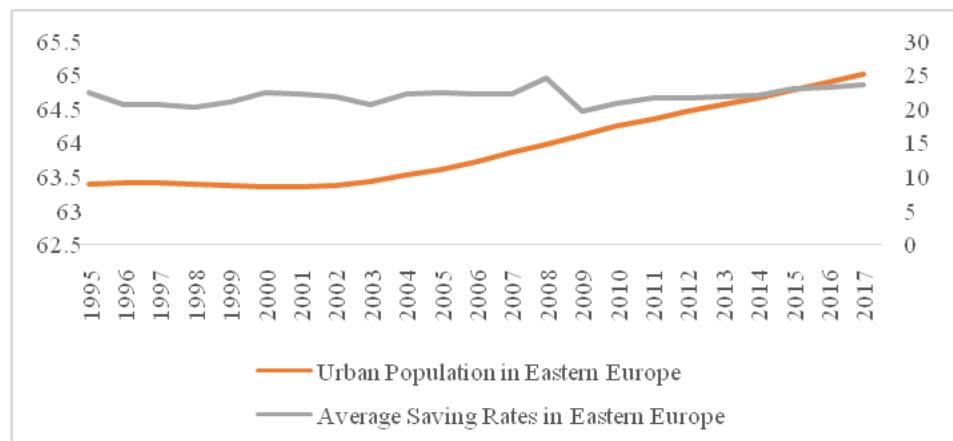


Source: World Bank, 2018.

In addition to ODR, Young Dependency Rate (YDR), another determinant of saving, is worth taking into account. As it can be viewed from Figure 6, on the contrary to ODR, Eastern European Countries displayed a decreasing trend with YDR. Figure 6 clearly displays the existing negative correlation between YDR and

saving rates of Eastern European Countries. Similar with the ODR, previously seen, Moldova showed the highest rate with YDR while the lowest YDR was observed in Bulgaria. Yet, migration from Bulgaria and Romania was expected to continue because per capita income of these countries is still half of the EU average. In 2002, the first year when Bulgarian and Romanian citizens were allowed to reside and work in some EU countries, more than 2.5% of population emigrated (Djankov, 2016). When it was considered that the majority of this population were youth, the low YDR level of Eastern European Countries was assessed as an expected result.

**Figure 7. Urban Population and Saving Rates in Eastern Europe (Average %)**

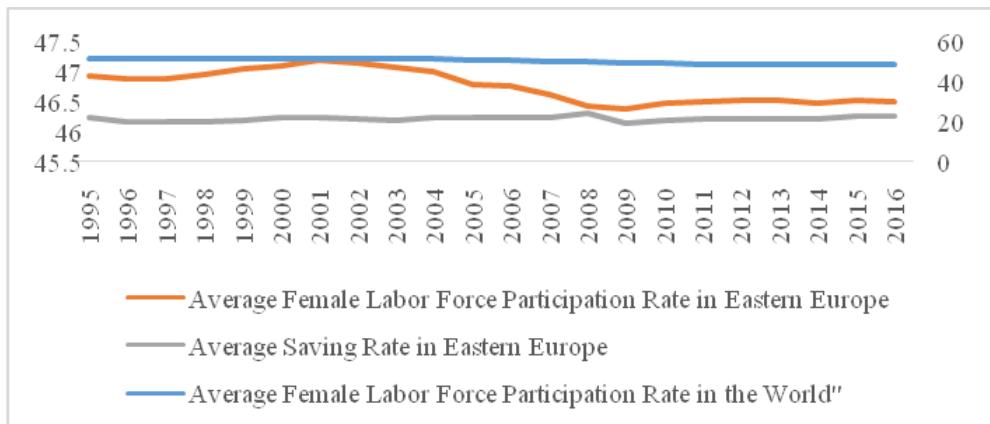


Source: World Bank, 2018.

With regard to the urban population of Eastern European Countries, Figure 7 constantly displays an increasing trend along years. The urbanization rate increasing especially after 2001 was associated with the EU membership of some Eastern European Countries. Despite the continuous increase in the urban population, no similar change is observed in the average saving rates.

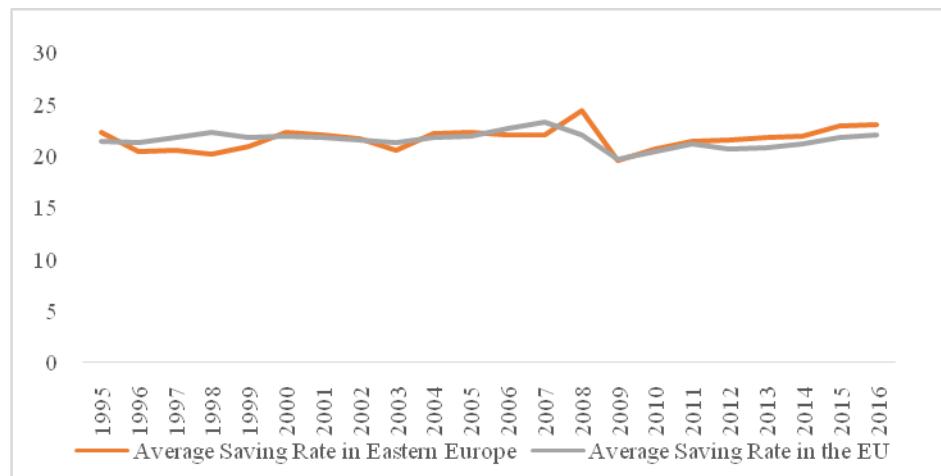
When Female Labor Force Participation Rate (LBF) exhibited by Figure 8 was considered for Eastern European Countries and the world, Eastern European Countries showed a performance below the world average except in 2000. Only Moldova showed a high (50.47%) LBF performance compared to the world average (50.44%). As a solution to the falling labor force in Eastern European countries, policy makers can invest in childcare, regulate flexible working hours, and create incentives for return to the workforce after having children, to promote women's labor force participation.

**Figure 8. Female labor force participation rate and saving rate in the world and Eastern Europe (Average %)**



Source: World Bank, 2018.

**Figure 9. Saving rates in EU and Eastern Europe (Average %)**



Source: World Bank, 2018.

Another view asserts that former communist countries strongly tended to make savings until 1990 (Irandoost, 2017). Deaton (1989) describes the saving concept existing in the communist era as “involuntary saving”. In line with Deaton’s (1989) determination, it is possible to see that consumption behaviors have worsened and saving rates have significantly dropped across Eastern Europe after the 1990s due to substantial political, economic, social and cultural transformations; and that these countries have reached a saving rate level close to the EU average after 1999

(Niculescu-Aron, 2011). In Eastern European Countries, while the saving rate has surged to the average of the EU level, residents have managed to finance all various consumption goods, especially electric appliances and automobiles. As shown in Figure 9 comparing the average saving rates of the EU and Eastern European Countries, due to the essentially adverse impact of the Asian Crisis on developing countries and Russia in 1998, saving rates in Eastern European Countries showed a remarkable decrease compared to the EU average; and vice versa existed during the Euro Crisis in 2009, during which the highest average saving rate in Europe was displayed by Russia (27.73%), and the lowest was displayed by Moldova (16.99%).

By considering the variables available in the current literature, it was seen that figures were not sufficient to explain the correlation between the country saving rate and demographic factors. Therefore, an empirical analysis on collected data was more appropriate to reveal the correlation between these variables and the saving rates of Eastern European Countries.

### **3. Analysis**

#### **3.1. Data set**

In this study, the effects of demographic factors such as urbanization rate, population growth, young and old dependency rates, life expectancy and female labor force participation rate on countries' national savings were analyzed for Eastern European Countries (EEC), comprising Belarus, Bulgaria, Czech Republic, Poland, Hungary, Moldova, Romania, Russia, Ukraine and Slovakia for the period 1996-2017. The annual data employed in the study was obtained from World Bank website (<https://data.worldbank.org/indicator>). Of this data, savings (S) refers to the share of savings in GDP; Population Growth (PG) refers to annual population growth rate; Urbanization (UP) refers to urbanization rate in total population; Old Dependency (OD) refers to the rate of old population compared to employed population; Young Dependency (YD) refers to the rate of young population compared to employed population; Female Labor Force Participation (LBF) refers to rate of female employers compared to total labor force; and Life Expectancy (LE) refers to total expected years of life after birth. The logarithm of the LE variable (LEB) was calculated before being included in the analysis for the normalization and simplification of calculation.

#### **3.2. Model**

The present study employed the following model to investigate the effect of demographic factors of Urbanization Rate (UP), Population Growth (PG), Young Dependency (YD) and Old Dependency (OD) Rates, Life Expectancy (LE) and Female Labor Force Participation Rate (LBF) on countries' national savings:

$$S_t = \beta_0 + \beta_1 PG_t + \beta_2 UP_t + \beta_3 OD_t + \beta_4 YD_t + \beta_5 LBF_t + \beta_6 LEB_t + u_t \quad (1)$$

The null hypothesis of this study shows that there is no relationship between savings and demographic factors in EEC when the sample is restricted to the 1996-2017 periods.

### 3.3. Panel unit root test

The stationarity of series was examined by the tests suggested by Levin, Lin, Chu (2002) (LLC), Im, Pesaran, Shin (2003) (IPS) and Hadri (2000). Of these tests, while LLC and IPS assume that horizontal cross-sections composing the panel are homogeneous, Hadri test assumes vice versa. Similarly, while the null hypothesis of LLC and IPS Tests is “series are not stationary”, the null hypothesis of Hadri test is “series are stationary”.

**Table 2. Panel unit root tests**

		LPF	LEB	ED	PG	S	UP	YP
<b>LLC</b>		0.45 (0.67)	-0.77 (0.22)	3.41 (0.1)	-1.21 (0.11)	-0.17 (0.43)	0.80 (0.21)	2.77 (0.1)
<b>IPS</b>		-0.45 (0.32)	2.81 (0.99)	2.99 (0.1)	-0.94 (0.17)	-0.36 (0.36)	1.42 (0.92)	1.05 (0.85)
<b>Hadri</b>	<b>Z</b>	16.88 (0.00)	9.67 (0.00)	17.57 (0.00)	6.37 (0.00)	6.95 (0.00)	20.93 (0.00)	16.54 (0.00)
	<b>statistics</b>							
	<b>Z<sup>a</sup></b>	12.13 (0.00)	9.82 (0.00)	13.56 (0.00)	7.38 (0.00)	6.71 (0.00)	19.14 (0.00)	14.57 (0.00)
	<b>statistics</b>							
		<b>ΔLPF</b>	<b>ΔLEB</b>	<b>ΔED</b>	<b>ΔPG</b>	<b>ΔS</b>	<b>ΔUP</b>	<b>ΔYP</b>
<b>LLC</b>	<b>LLC</b>	-1.70** (0.04)	-2.64*** (0.00)	-4.65*** (0.00)	-3.99*** (0.00)	-8.96*** (0.00)	-8.35*** (0.00)	-5.34*** (0.00)
<b>IPS</b>	<b>IPS</b>	- 6.14*** (0.00)	-4.58*** (0.00)	-3.04*** (0.00)	-6.02*** (0.00)	-7.86*** (0.00)	-7.37*** (0.00)	-7.10*** (0.00)
<b>Hadri</b>	<b>Z</b>	0.81*** (0.21)	1.59* (0.06)	2.11 (0.02)	0.18*** (0.43)	0.32*** (0.37)	6.45 (0.00)	2.75 (0.00)
	<b>statistics</b>							
	<b>Z<sup>a</sup></b>	1.37* (0.09)	0.84*** (0.20)	1.37* (0.09)	1.13*** (0.45)	1.11*** (0.13)	6.27 (0.00)	2.75 (0.00)
	<b>statistics</b>							

*Note:* Given values are relevant test statistics as the ones in brackets are probability values.

\*\*\*, \*\* and \* denote 1%, 5% and 10% significance levels, respectively. **Z<sup>a</sup>**; Heteroskedastic Consistent Z statistics. **Δ**; the first difference of the respective variable is taken.

Thus, Hadri test is utilized for the confirmation of other tests. At this point, all three tests were conducted together to cover all possible circumstances. Panel Unit Root Test was conducted for Eastern European Countries and the obtained results are shown in Table 2. Based on the test results shown in Table 2, the series were not

stationary at their level values and they became stationary when their first difference was taken. This situation suggested that significant changes occur between country savings and their demographic factors.

### 3.4. Panel co-integration test

The existence of panel co-integration relationship between series was examined by the tests suggested by Kao (1999) and Pedroni (2004). These panel co-integration tests are named first-generation panel co-integration tests. Pedroni (2004) has developed seven different test statistics in order to test the existence of the panel co-integration relationship between the series under the heterogeneity assumption. The null hypothesis of Kao (1999) and Pedroni (2004) tests is given as “no co-integration exists between series”. Table 3 exhibits Kao (1999) and Pedroni (2004) panel co-integration test results.

**Table 3. Panel co-integration test results**

		Constant		Constant-Trend		No Constant - No Trend	
		Test Stat	Probability Value	Test Stat	Probability Value	Test Stat	Probability Value
Pedroni	<b>Panel v-</b>	-	1.00	-	1.00	-	0.99
	<b>Panel p-</b>	2.31	0.99	3.47	0.99	1.5	0.96
	<b>Panel t-</b>	-	0.00***	-	0.00***	-	0.00***
	<b>Panel ADF- Statistics</b>	-	0.00***	-	0.00***	-	0.00***
		4.38		5.01		4.9	
	<b>Group p- Statistics</b>	3.79	0.99	4.58	1.00	2.9	0.99
	<b>Group t-</b>	-	0.00***	-	0.00***	-	0.00***
	<b>Group ADF- Statistics</b>	-	0.00***	-	0.00***	-	0.00***
		4.11		5.05		3.3	
	<b>Kao</b>	<b>ADF Test</b>	1.90	0.02***	-	-	-

*Note:* \*\*\* denotes existence of co-integration relationship at 1% significance level.

According to Table 3, it was determined that the series were co-integrated on the long-run and that the co-integration relationship existed between series at 1% significance level. This finding evidenced that the model estimations that would be made based on the level values of the series have not been the spurious regression problem. Additionally, these results suggested that there is a long-run steady-state

relationship between saving rates and the variables of population growth, urbanization, young and old dependency rates, female labor force participation rate and life expectancy in EEC.

### **3.5. Long-run analysis: estimation of co-integration coefficients**

Within the scope of the study, the long run panel co-integration regression was estimated with Panel Fully Modified Least Squares (PFMOLS) method and the obtained results are displayed in Table 4.

**Table 4. Estimation results of co-integration coefficient**

S	Coefficient of Independent Variable	t-statistics	Probability Value
<b>PG</b>	1.703304***	3.683884	0.0003
<b>OD</b>	-0.230667***	-3.287248	0.0012
<b>LEB</b>	-0.396742	-0.424800	0.6714
<b>LBF</b>	0.253104***	3.367074	0.0009
<b>UP</b>	0.304094***	14.91849	0.0000
<b>YD</b>	-0.113232**	-2.182442	0.0302
<b>R<sup>2</sup>=0.31</b>	<b>R̄<sup>2</sup>=0.29</b>		<b>F- statistics=14.45</b>

*Note:* \*\*\* and \*\* denote that relevant parameters are statistically significant at 1% and 5% significance levels, respectively.

Based on the findings summarized in Table 4, it was seen that 1% increase in Eastern European Countries' PG, LBF and UP increase savings by 1.70%, 0.25% and 0.30%, respectively. In the meantime, 1% decreases in the YD and OD rates of these countries increase their savings by 0.11% and 0.23%, respectively. On the other hand, the effect of LEB on savings was found to be negative but statistically insignificant. The obtained results were consistent with our expectations and with the literature, namely, Leff (1969), Modigliani (1970), Modigliani and Sterling (1983), Graham (1987), Masson *et al.* (1998) and Loayza *et al.* (2000). Population growth rate was identified as the most significant demographic factor effective on savings across Eastern European Countries. After the strict, economically controlled system, these countries made a fast transition so that they could develop their demographic situation. In this period, while the female labor force was increasing rapidly, the urban population made progress, similarly. The average rate of saving of these countries also became quite high compared to the European Union countries. The empirical findings support the positive relationship between the population, the female labor force and the urban population growth and savings. While there are many factors which influence the saving behaviors of the countries, as Niculescu-Aron and Mihăescu (2012) mentioned their paper, the most visible factors are security and stability of

income, especially in Central and Eastern Europe. The demographic developments of countries also improve if economic stability occurs.

### 3.6. Short -run analysis: error correction mechanism

The vector error correction model was estimated for performing short-run analysis:

$$\Delta S_t = \beta_0 + \beta_1 ECT_{t-1} + \beta_2 \Delta PG_t + \beta_3 \Delta OD_t + \beta_4 \Delta LEB_t + \beta_5 \Delta LBF_t + \beta_6 \Delta UP_t + \beta_7 \Delta YD_t + u_t \quad (2)$$

Where  $\Delta$  is the first difference operator;  $ECT_{t-1}$  is the one period lag length of the residuals obtained from the long-term analysis of a model. By the short-run analyses, the results estimated by using Panel Ordinary Least Squares (POLS) method are shown in Table 5 below;

**Table 5. Estimation results of short-run analysis**

$\beta_2$	$\beta_3$	$\beta_4$	$\beta_5$	$\beta_6$	$\beta_7$	$ECT_{t-1}$	Constant	$R^2$	$\bar{R}^2$	$F_{ist.}$
							Term			
1.25 [1.40]	0.82 [1.08]	-81.38 [-1.61]	0.40 [0.47]	-0.19 [-0.18]	-0.43 [-]	-0.30*** [-2.93]	-0.26 [-0.53]	0.17 0.14	0.14 5.77	
						0.94]				

Note: \*\*\* indicates that relevant parameters are statistically significant at 1% significance level. [] refers t-statistic values.

Based on the results in Table 5, the coefficient of  $ECT_{t-1}$  was negative and statistically significant at the 1% level. In this case, it was seen that the error correction mechanism of the model was functioning. That is, short-run deviations between the series disappeared in the long-run and there was fast convergence to the equilibrium relationship. Furthermore, the estimation of a panel vector error correction model indicates the presence of long-run causality between demographic factors and saving rates, thus supporting Leff 's (1969) approach.

## Conclusions

The saving tendency differs among countries and changes with respect to their demographic, economic and geopolitical statuses. Based on the life-cycle hypothesis, while individuals do not make savings during their youth and low-income periods, their tendency to make savings increase during their maturity period, when their productivity is maintained at a high level; and they will turn back to the non-saving status in their elderliness period. The validity of this situation for individual countries is directly related to their demographic structures. Therefore, saving, a constituent of development and growth, is a substantially important issue for Eastern European Countries which share a common history and have incurred a

significant demographic transformation. In this scope, savings' long-term effect on demographic factors such as urbanization rate, young dependency rate, old dependency rate, female labor force participation, life expectancy and population growth savings was investigated for Eastern European Countries, comprising Belarus, Bulgaria, Czech Rep., Poland, Hungary, Moldova, Romania, Russia, Ukraine and Slovakia for the period 1996-2017 by means of Panel Co-integration Analysis methods. The stationarity of series was examined by LLC, IPS and Hadri Panel Unit Root Tests; and it was seen that the series were not stationary with their level values and become stationary, or I (1), when their first difference was taken. This status was assessed as significant changes occur between countries' savings and demographic factors.

The existence of co-integration relationships between series was examined by means of Kao (1999) and Pedroni (2004) Panel Co-integration Tests; and it was determined that savings and considered demographical factors were co-integrated in these countries. Based on the Long-Run Analysis results, a 1% increase in population growth, female labour force participation, and urbanization rate will increase savings by about 1.70%, 0.25% and 0.30%, respectively. On the other hand, a 1% increase in young dependency and old dependency rates will decrease saving by about 0.11% and 0.23%, respectively. The most significant demographic factor increasing savings of Eastern European Countries was determined as population growth rate. According to these results, the null hypothesis of the study was rejected, except LEB. The decrease in population growth could be associated with an increase in the number of no-children or fewer-children families and in the decrease in the saving tendency due to motivation of inheritance especially when it is considered that young population dependency rate has decreased continuously. As a result of panel vector error correction model, it was determined that there was long-run causality between demographic factors and saving rates. According to the findings of this study, it could be suggested that Eastern European Countries should review their policies towards outgoing immigration, should introduce reforms regarding their social security system so that the old population could become less dependent on their children; also, they should introduce regulations to increase the income of the urban population and to ensure that women participate in the national labour force in order to increase their savings.

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